LLNL Environmental Restoration Division Standard Operating Procedure	TITLE: Guide to the Handling, Packaging, and Shipping of Samples
APPROVAL Date _____ _____ Environmental Chemistry and Biology Group Leader	PREPARER: V. Dibley REVIEWERS: R. Brown*, T. Carlsen, E. Christofferson*, J. Duarte, B. Failor*, J. Gardner**, R. Goodrich, B. Hoppes*, G. Howard, G. Kumamoto, and B. Ward*
APPROVAL Date _____ _____ Division Leader CONCURRENCE Date _____ _____ QA Implementation Coordinator	PROCEDURE NUMBER: ERD SOP-4.4 REVISION: 2 EFFECTIVE DATE: December 1, 1995 Page 1 of 14

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1.0 PURPOSE

To define the steps required to properly package and ship environmental samples to analytical laboratories and off-site vendors. The transportation of samples must be designed to protect the integrity of the sample, prevent any detrimental effects from the potentially hazardous nature of the samples, and comply with applicable regulations.

2.0 APPLICABILITY

This procedure is applicable to handling, packaging, and shipping samples for the Environmental Restoration Division (ERD) and the Environmental Monitoring Program (EMP).

3.0 REFERENCES

3.1 Code of Federal Regulations, 40 CFR ch. 1 (7-1-92 Edition), Part 136.3, Office of the Federal Register, National Archives and Records Administration, U.S. Govt. Printing Office, Superintendent of Documents, Mail Stop SSOP, Washington, D.C. 20402-9328.

3.2 Code of Federal Regulations, 49 CFR, Parts 171 and 172.101, Section 8, Office of the Federal Register, National Archives and Records Administration, U.S. Govt. Printing Office, Superintendent of Documents, Mail Stop SSOP, Washington, D.C. 20402-9328.

3.3 Code of Federal Regulations (CFR, 1991b) 40 Part 261.4 (d)(1), Revised July 1, 1991. Office of the Federal Register, National Archives and Records Administration, U.S. Govt. Printing Office, Superintendent of Documents, Mail Stop SSOP, Washington, D.C. 20402-9328.

4.0 DEFINITIONS

4.1 Sample

A representative fraction of material tested or analyzed in order to determine the nature, composition, and percentage of specified constituents, and possibly their reactivity (e.g., environmental samples, blanks, etc.).

5.0 RESPONSIBILITIES

5.1 Division Leader

The Division Leader's responsibility is to ensure that all samples packaged and shipped for the ERD comply with all pertinent regulations and procedures.

5.2 Field Personnel

The field personnel are responsible for properly handling and packaging samples collected for ERD. They are also responsible for delivering samples to the lock box or sampling coordinator (SC) for shipment or delivery to the laboratory in accordance with all applicable internal and external regulations and procedures. They must also ensure that the samples delivered are representative of the original material. The field personnel must also complete, date, and sign in the appropriate sections of the Chain-of-Custody (CoC) and ERD Shipping Forms.

5.3 Sampling Coordinator (SC), Task Leader, or Group Leader

The SC, Task Leader, or the appropriate Group Leader is responsible for determining whether samples are hazardous or nonhazardous. To make this distinction, best professional judgment and historical data should be used when available.

6.0 PROCEDURE

When samples collected at a site are classified hazardous or environmental non-hazardous, a distinction between these samples must be made to 1) determine the appropriate procedures for transporting the samples, and 2) protect the health and safety of the shipping and laboratory personnel receiving the samples. Special precautions, procedures, and secondary containment areas within the laboratories will be used when hazardous samples are received.

6.1 Hazardous Substances

6.1.1 A hazardous substance is defined by 49 CFR, part 171, section 8 as a material including its mixtures and solutions that meet the following criteria:

- As listed in the appendix to Section 172.101,
- Is in a quantity, in one package, which equals or exceeds the reportable quantity (RQ) listed in the appendix to Section 172.101, and
- When a mixture or solution is in a concentration corresponding to the RQ of the material. See following table:

	Concentration by weight	
RQ pounds (kilograms)	**Percent**	**Part per million (ppm)**
5000 (2270)	**10**	**100,000**
1000 (454)	**2**	**20,000**
100 (45.4)	**0.2**	**2,000**
10 (4.54)	**0.02**	**200**
1 (0.454)	**0.002**	**20**

6.1.2 The following table example lists hazardous substances and corresponding RQs from the appendix to Section 172.01:

Hazardous substance	RQs lb (kg)	Hazardous substance	RQs lb (kg)
Arsenic	**1 (0.454)**	**1,2-Dichloroethene**	**1000 (454)**
Benzene	**10 (4.54)**	**Freon 11**	**5000 (2270)**
Beryllium	**10 (4.54)**	**Hydrochloric acid**	**5000 (2270)**
Chloroform	**10 (4.54)**	**Mercury**	**1 (0.454)**
Chromium	**5000 (2270)**	**Nickel**	**100 (45.4)**
Copper	**5000 (2270)**	**Nitric acid**	**1000 (454)**
1,1-Dichloroethane	**1000 (454)**	**Tetrachloroethene**	**100 (45.4)**
1,2-Dichloroethane	**100 (45.4)**	**Toluene**	**1000 (454)**
1,1-Dichloroethene	**100 (45.4)**	**Trichloroethene**	**100 (45.4)**

6.1.3 For example: If you had a substance weighing 1 lb that contained arsenic at 20 mg/kg (ppm), it would be considered hazardous material. Regulations for packaging, marking, labeling, and shipping hazardous material, hazardous substances, and hazardous wastes are promulgated by the U.S. Department of Transportation (DOT) and described in the Code of Federal Regulations (CFR). However, these regulations were not intended to cover the shipment of small

quantities (1 kg or less for single packages) or samples collected at hazardous waste sites that are transported to laboratories for testing.

6.1.4 To ship samples classified as hazardous or materials identified as the U.S. DOT hazardous material other than hazardous waste and radioactive materials, contact the LLNL Shipping Department, Material Distribution Division. For example: empty containers once containing a hazardous substance (i.e., empty H_2O_2 containers) and other samples labeled hazardous material are considered hazardous.

6.2 Non-Hazardous Substances

6.2.1 Non-hazardous samples are not subject to the same packaging, labeling, and shipping requirements as hazardous wastes, but to qualify for this exemption the collector must, according to 40 CFR, Part 261.4(d):

A. Comply with DOT, U.S. Postal Service (USPS), other applicable shipping requirements, or

B. Comply with the following requirements if the sample collector determines that DOT, USPS, or other shipping requirements do not apply to the shipment of the sample:

1. Assure that the following information accompanies the sample:
   - Sample collector's name, mailing address, and phone number.
   - Laboratory's name, mailing address, and telephone number.
   - Quantity of sample.
   - Date of shipment.
   - Description of sample.

   Note: These requirements are routinely met by the inclusion of the CoC (Attachment B) documentation that accompanies samples shipped to contract analytical laboratories.

2. Package the sample so that it does not leak, spill, or vaporize.

C. The LLNL Shipping Document (Attachment A), required by the LLNL Shipping Department, must be prepared *in advance* by the ERD Resource Administrator to accompany the environmental samples to be shipped. The SC or person responsible for shipping samples, must fill in the date, note the quantity and material type, and certify the document with a signature/date.

6.2.2 When ERD samples are classified as nonhazardous and the analytical laboratory pays for the shipment (via courier or Federal Express), an ERD shipping form (Attachment C) must be filled out completely. This process eliminates the LLNL Shipping Department, yet provides all the pertinent information. The ERD Shipping Form consists of a top page and a bottom carbon copy. The original top page must be sent to the Traffic Office and the bottom copy to ERD's Data Management Group (DMG). Analytical laboratories that require LLNL to pay for Federal Express, must go through the LLNL Shipping Department and use LLNL shipping document. (Attachment A)

6.2.3 Environmental samples with an unknown history are not considered hazardous until 1) the analytical laboratory has analyzed the sample and identifies it as hazardous, 2) the personnel suspect the sample is hazardous, or 3) there is doubt of the sample classification. Once this is determined, samples are shipped accordingly.

6.3 Preservation

6.3.1 Preserved environmental samples considered hazardous must go through the LLNL Shipping Department using their shipping documents, unless they meet the requirements of 40 CFR, Section 136.3, Table II, note #3. This requirement states that the Hazardous Materials Regulations do not apply to the following materials:

- Hydrochloric acid (HCl) in water solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater).
- Nitric acid (HNO_3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater).
- Sulfuric acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater).
- Sodium hydroxide (NaOH) in water solutions at concentrations of 0.08% by weight or less (pH about 12.30 or less).

6.3.2 If the samples are to be preserved, the sampler should:

A. Determine the approximate volume of acid (or base) needed to preserve a sample, yet still keep it safely within the criteria stated in Section 6.2.4 of this SOP.

B. Preserve the appropriate samples using the pre-determined amount of acid (or base).

C Spot check 10% of preserved samples using pH paper or meter.

D. If any of the tested samples pH do not meet the preservation requirement, test all samples and add more acid (or base) as required. If any of the tested samples have a pH outside the shipping criteria (stated in Section 6.2.4 of this SOP) test all samples. If the pH is outside the criteria, the samples are considered hazardous and must be shipped by the LLNL Shipping Department as hazardous material. If the pH is within the criteria, the samples may be shipped as nonhazardous.

6.4 Radioactive Material

Samples considered as radioactive materials must be shipped through the LLNL Materials Management Section, Engineering Sciences Division. Radioactive material is defined by DOT as any material having a specific activity greater than 0.002 microcuries per gram (µCi/g). The highest tritium activity detected in a Site 300 well is ~600,000 pCi/L. This converts to 0.0006 µCi/g which is below the U.S. DOT limit for radioactivity. Therefore, samples from this well do not need to be shipped by the Materials Management Section.

6.5 Hazardous Waste

For all materials identified as hazardous waste, contact the Hazardous Waste Management Division.

6.6 Office Preparation

Consult the SC or the Task Leader for the type of samples to be collected and their destination once collected.

6.7 Field Preparation

6.7.1 Verify that all sample bottles have been correctly identified and labeled appropriately (i.e., location, time, date, etc.).

6.7.2 Record samples on the CoC form. The instructions to complete this form are presented in SOP 4.2, "Sample Control and Documentation."

6.7.3 Complete the logbook entries, verify accuracy of entries, and check pages for signatures or initials.

6.8 Operation

6.8.1 Marking and Labeling

Sample containers must have a completed sample identification tag as described in SOP 4.2. DOT marking and labeling is not required for the majority of samples. However, the sample labels of samples preserved with acids (or bases) should indicate that the sample is corrosive.

6.8.2 Packaging

Properly identified sample containers should be placed inside Ziploc®-type storage bags and sealed, then placed in picnic cooler-type containers. Samples to be shipped must be packed with sufficient incombustible, absorbent cushioning material to minimize the possibility of sample container breakage. Samples that require refrigeration during shipping should be packed with a sufficient number of samples with Blue Ice packs to keep samples preserved.

6.8.3 Custody

As in other activities used to support litigation, regulatory agencies must be able to provide the chain of possession and custody of any samples which are offered for evidence, or which form the basis of analytical test results introduced as evidence. Written procedures must be available and followed whenever evidence samples are collected, transferred, stored, analyzed, or destroyed. The primary objective of these procedures is to create an accurate written record which can be used to trace the possession and handling of the sample from the moment of its collection through analysis and its introduction as evidence.

A. A sample is in someone's custody if:

1. It is in one's actual possession, or

2. It is in one's view, after being in one's physical possession, or
3. It is in one's physical possession and then locked up so that no one can tamper with it, or
4. It is kept in a secured area, restricted to authorized personnel only.

6.8.4 Turnaround Time

It is a good practice to have the SC or QC Chemist call the analytical laboratories before shipping samples to verify that they have the capacity to analyze the samples within their hold and turnaround times. Most laboratories can better process samples when they can plan their work load and down times. The analytical laboratory must be notified in advance if incoming samples:

1. Require a rapid turnaround time.
2. Considered hazardous.
3. Arrive with short holding times.
4. If there are a large number of samples to be shipped.

6.8.5 Documentation

A. A CoC form must accompany all sample packages sent to the laboratories on and off site.

B. The ERD Shipping Form is completed when non-hazardous samples are delivered to the LLNL or Site 300 lock box.

C. The LLNL Shipping Document is required when hazardous samples or non-hazardous samples are sent to the analytical laboratory via Federal Express. Non-hazardous samples that require Federal Express shipping are delivered to the SC and the SC delivers the samples to the LLNL Shipping Department.

D. Packages to be mailed can be registered with a return receipt request.

E. Receipts should be retained from packages sent by a common carrier as part of the permanent CoC documentation.

Note: A copy of these forms should be sent to and retained by the Data Management Group.

6.8.6 Transfer of Custody and Shipment

When transferring the samples, the transferee must sign and record the date and time on the CoC form (SOP 4.2). The sample custodian in the field must account for each sample (or group of samples) when custody transfers are made. Individuals who take custody transfers must complete the appropriate section of the CoC form.

6.8.7. Temperature Blanks

Temperature blanks are to accompany all samples which require temperature preservation (4° C [degrees centigrade]). They should consist of a 250 ml poly container or equivalent filled with water. The receiving analytical laboratory should measure these blanks to ensure sample integrity. The blanks should be

returned from the analytical laboratory and can be reused. It should be noted on CoC forms (under the comments section) that a temperature blank is enclosed in the shipment. If the blank temperature exceeds 4°C ± 2°C (upon sample receipt), the receiving analytical laboratory should notify the SC or other appropriated personnel.

7.0 QA RECORDS

7.1 Chain-of-custody forms

7.2 Logbooks and field sheets

8.0 ATTACHMENTS

Attachment A—LLNL Shipping Document

Attachment B—Chain-of-Custody Form

Attachment C—ERD Shipping Form

Attachment A

LLNL Shipping Document

PRESENT LOCATION OF MATERIAL

BLDG.: ROOM:

REQUESTED BY: MAIL CODE L-

BLDG.: ROOM: EXTENSION

PROPERTY CENTER REP.: MAIL CODE L-

APPROVED BY: DATE: EMPLOYEE NO.:

AUTHORIZED BY: DATE: EMPLOYEE NO.:

BEAR DOWN—8 PART FORM

UNIVERSITY OF CALIFORNIA

SHIPPING DOCUMENT

FOR CONTRACT NO. W-7405-ENG-48 WITH THE DEPARTMENT OF ENERGY

❒ BERKELEY ❒ SITE 300

❒ LIVERMORE ❒ NEVADA

SHIPPING DOCUMENT NUMBER

PAGE 1 OF ___ PAGES

DATE	NO. OF RECEIVAL SET
PURCHASE ORDER NO.	ACCOUNT NO.
BUYER:	EXTENSION
SANL NO.:	BORROWER NO.:
LOAN NO.:	S.R.R. NO.:

SHIP TO:

ATTENTION:

ADDRESS

CITY, STATE AND ZIP CODE

DATE REQUIRED AT DESTINATION	VALUE OF MATERIAL $	FREIGHT CHARGES: COLLECT	PREPAID	PREPAID: DEDUCT FROM INVOICE PER ACCT. DEPT. BY:
SELLER'S PROPERTY ❒ LAB. (GOVT.) PROPERTY ❒	DECLARE VALUE ON WAYBILL ❒ DO NOT DECLARE VALUE ON WAYBILL ❒			"SELLER RETURN" AUTHORIZED BY

METHOD OF SHIPMENT:

ENTER CODE

OTHER

METHOD OF SHIPMENT CODES:

1. PICK-UP
2. PARCEL POST
3. UPS
4. OVERNIGHT DELIVERY
5. MOTOR FREIGHT
6. HAND CARRY
7. AIR PARCEL POST
8. 2nd DAY DELIVERY
9. AIR FREIGHT
10. LAB TRUCK
11. DOE AIRCRAFT
12. AIR FREIGHT FORWARDER

REASON FOR SHIPMENT:

ITEM NO.	QUANTITY	DESCRIPTION	P.O. ITEM NUMBER	SERIAL, PROPERTY AND/OR CATALOG NUMBER
		MATERIAL CLASSIFICATION ___		

MATERIAL TYPE (CHECK APPLICABLE): ❒ EXPLOSIVE ❒ RADIOACTIVE ❒ PRESSURE VESSEL ❒ NONHAZARDOUS ❒ TOXIC, CORROSIVE OR FLAMMABLE ❒ FORMERLY CONTAINED RADIOACTIVE MATERIAL

I CERTIFY, BY SIGNING BELOW, THAT THE INFORMATION CONTAINED IN THIS DOCUMENT IS CORRECT TO THE BEST OF MY KNOWLEDGE.

SIGNATURE EMPLOYEE NO. DATE

FOR USE BY SHIPPING SECTION ONLY

PACKED BY:	NUMBER OF PKGS.:	TYPE OF PKG:	WEIGHT:	EQUIPMENT CHECKED BY:
SHIPPED BY:	DATE SHIPPED:	CARRIER:		WAYBILL NUMBER:

RECEIVED BY: ___ DATE: ___

LL 1095-3 (Rev. 2/92) 7600-62899

Attachment B

Chain-of-Custody Form

ERD Chain-of-Custody Record and Analytic Instructions

Page ____ of ____ A00000

Sampled By :_____

Sampler's Employer:_____

Project Name :_____

_____

Analytical Lab Please
Fax or Email copies to:

_____ Fax# / Email _____

_____ Fax# / Email _____

_____ Fax# / Email _____

Requester, (circle one)
S300
WGMG
Livermore

Send all results to:
Attn: ERD DMG L-528
Lawrence Livermore
National Laboratory
P.O. Box 808
Livermore, CA 94550

Field Log Book# (COC#) _____ **Release #** _____

LLNL Acct. # _____ Sampling Release# _____

Analytical Laboratory Name_____

Analytical Laboratory Log #_____

Sample Identification	Sample Date/Time	Matrix[2] Container[3]	# of Cont.	Study Area	Analysis & Turnaround Required[1]	* Remarks *
1						
2						
3						
4						
5						
6						
7						
8						
9						

ERD

Signature	Company	Time	Date
Relinquished by			
Received by			
Relinquished by			
Received by			
Relinquished by			
Received by			

[1] N = normal turnaround, X = 16-hr. turnaround, R = 24-hr. turnaround,
H = Hold do not analyze unless requested

[2] Sample Matrix Codes: **See list on back of pink copy**

[3] Container type codes: V = VOA Bottle, P = Polyethylene Bottle,
G = Glass Bottle, T = Brass Tube,
B = Bag, S = Stainless Steel Tube,
O = Other (specify under remarks)

To receive copies of this data from DMG
CC:

Revision 4.1
13 Oct 95 ERD

White : Laboratory return to ERD
Attn. ERD Data Management Team L-528

Yellow : Analytical Lab

Pink: Sampler leave with ERD
Attn. ERD Data Management Team L-528

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Attachment C

ERD Shipping Form

Environmental Restoration Division
NON-HAZARDOUS ENVIRONMENTAL SAMPLE SHIPPING REPORT

Date: _____

Destination: (Check one)

- ☐ California Laboratory Services (CLS), Rancho Cordova, CA 95742
- ☐ International Technology Corporation (IT), St. Louis, MO 63045
- ☐ GTEL Environmental, Concord, CA 94520
- ☐ Other _____ (Please specify) _____ (Zip Code)

These destination laboratories serve as the courier themselves.

Contact: **Site 300** **Mainsite**

(Check one) ☐ Valerie Kiszka 2-9777 ☐ Gene Kumamoto 2-8128

Commodity: (Check below all that apply)

- ☐ Aqueous Environmental Samples
- ☐ Soil Environmental Samples
- ☐ Solid Environmental Samples
- ☐ Vapor Environmental Samples

Number of Packages: (example: 1 ice chest) ☐

Total Weight: (estimated) ☐

Comments:

_____

_____

_____

Chain of Custody (COC) Accession Numbers: (Upper Right hand corner of COC)

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Report Prepared by :

_____ (Signature) _____ (Print name) _____ (Phone #)

Please Mail to The Traffic Office at L-516

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